Carbon accounting and the construction of competence

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Abstract
Carbon accounting has evolved rapidly over the past twenty years and now encompasses a wide range of activities with significant financial implications. This paper examines how competence in carbon accounting is being defined and claimed by different actors and communities. Specifically, it focuses on the role of the accountancy profession in carbon accounting, charting its engagement over time and its relationship with other communities involved in carbon accounting. The paper builds on recent work showing that multiple framings and activities are associated with carbon accounting, leading to conflicting views on what it means, how it should be done, and who should be involved. It draws on the concepts of epistemic communities and boundary-work to help explain the role of professions and the emergence of new institutions that mediate between different communities to achieve policy change. We find that, while accountants have undisputed authority in the field of financial reporting of rights and liabilities created under emissions trading schemes ('financial carbon accounting'), their claims to competence in other aspects of organisational carbon accounting overlap with those made by several other communities. Although the accountancy profession's interest in organisational carbon accounting can be traced back at least as far as 2001, the introduction of emissions trading in Europe in 2005 coincided with the start of a new, as yet largely un-scrutinised, initiative to extend its claims of relevant expertise, through a variety of methods including the promotion of standards for disclosure of physical and strategic climate-related information. The Climate Disclosure Standards Board provides an example of a boundary organisation that has been established by different communities with an interest in carbon accounting, with mutually beneficial results, which has nevertheless resulted in the production of a new Climate Change Reporting Framework that is heavily aligned towards the existing competence of accountancy professionals.

1 Introduction

Over the past twenty years, carbon accounting has evolved from a fringe activity conducted by a handful of specialist economists and scientists, to a highly diversified set of practices, some more specialist, others approaching mainstream, carried out by numerous actors belonging to a variety of different communities (Ascui and Lovell, 2011). It has become clear that the financial stakes are high, with transactions in carbon markets reaching US$142 billion in 2010, and the Copenhagen Accord promising developing countries assistance to the tune of US100 billion/year by 2020 (Linacre et al., 2011; United Nations Framework Convention on Climate Change, 2009). Consequently, it is hardly surprising that we can discern, within the field of carbon accounting, emerging tensions between different communities over the limits and boundaries of professional expertise, control over the content and process of standards development, and attempts to link new forms of carbon accounting to existing areas of professional practice.

In many ways this process of "discursive competition" echoes ways in which the accounting profession sought to extend its claims to expertise into the new field of environmental auditing in the 1990s, as documented by Michael Power (1991; 1996; 1997). However, although similar patterns may be discerned, the potential economic scale and transformative impact of carbon accounting easily surpasses that of environmental audit, making the contemporary process of professionalization of carbon accounting all the more worthy of close examination.

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The research on which this paper is based was motivated by two main questions: first, what are the strategies being employed to define and lay claim to competence in the field of carbon accounting; and, second, who are the principal actors and communities involved in this? The paper builds on recent work showing that carbon accounting means different things to different people, with a long history of being framed as a matter of professional expertise by scientists, bureaucrats, economists and accountants, as well as by new communities of practice in the carbon markets (Ascui and Lovell, 2011). It focuses on the development of standards as a mechanism for defining who should carry out an activity, as well as what the activity is and how it should be implemented. The paper also builds on foundations established by Lovell and MacKenzie (2011) in a recent analysis of the role of accountancy professional organisations in governing carbon accounting. It extends this analysis, which focussed primarily on financial accounting and the activities of accountancy professional bodies and financial reporting standard setters, by setting carbon accounting in its wider context of distinct yet partially overlapping fields or frames of reference claimed by multiple "epistemic communities" (Haas, 1992a) where accountants are relatively recent entrants.

We examine the actors involved in the establishment of the Climate Disclosure Standards Board (CDSB) in 2007 and the development of its Climate Change Reporting Framework (released as an Exposure Draft in 2009 and published in September 2010), arguing that the CDSB appears to be a 'boundary organisation' linking two epistemic communities. One of these communities consists of people who are motivated by environmental concerns (albeit from an investor perspective), with an interest in expanding the scope and quality of carbon disclosure as a means towards improving carbon management and thus reducing greenhouse gas emissions, while the other consists mainly of individuals from accountancy professional bodies and the 'Big Four' global accountancy firms, who, as a profession, have a financial interest in the provision of services in support of carbon disclosure. Their cooperation seems to advance both sets of interests, but a consequence is that although the scope of the CDSB's Climate Change Reporting Framework covers only non-financial information on greenhouse gas emissions and strategic responses to climate change, it is presented in a format and via technical terminology that clearly aligns it with the existing financial reporting competence of accountancy professionals. The paper's main conclusion is that the accountancy profession is currently engaged in a major, as yet largely un-scrutinised, initiative to extend its claims of relevant expertise in carbon accounting, through a variety of methods including the promotion of standards linking carbon disclosure to existing competence in financial reporting.

1.1 What is carbon accounting?

Climate change poses numerous measurement, attribution, performance monitoring and verification challenges, from the global to the organisational and even down to the individual level. For example, the science of climate change relies on the assimilation of vast quantities of direct and indirect measurements of past and present greenhouse gas fluxes to and from the atmosphere, coupled with economic models of human activity, in order to develop predictive models of future climate change and the associated impacts. The politics of international climate change agreements such as the Kyoto Protocol relies on quantitative targets which require the calculation of human-induced emissions and removals of greenhouse gases within national boundaries. The very existence of entirely new markets in carbon rights and credits, estimated to be worth nearly US$142 billion in 2010 (Linacre et al., 2011), depends on complex acts of measurement and commensuration to create fungible, tradable instruments (MacKenzie, 2009). Thousands of companies, and other organisations, now monitor their greenhouse gas emissions, abatement actions and climate risk exposure through their internal management accounting and control systems, and around 3,000 companies reported on this to investors and the general public in 2010 via the Carbon Disclosure Project (PricewaterhouseCoopers, 2010). As a consequence of emissions trading schemes, carbon rights and obligations now have a financial value in many countries, which is beginning to attract the attention of accountants in terms of how these assets and liabilities should be reported in corporate financial

reports (Bebbington and Larrinaga-Gonzalez, 2008; Cook, 2009; KPMG, 2008; Lovell et al., 2010; McGready, 2008; PricewaterhouseCoopers and IETA, 2007).

To characterise all of these varied activities as 'carbon accounting' is already to accept and reinforce, to some degree, a rhetorical claim by accountants to relevant jurisdictional expertise in these areas. However, it is clear that many different communities of practice are involved, and conceptions of what each community does and what that practice should be called differ. In this paper, therefore, the generic term 'carbon accounting' is used as a provisional marker for something rather amorphous and contested; with the objective being to investigate the ways in which jurisdictional competence is being framed and negotiated by different communities. We therefore accept, at least provisionally, the 'pick and mix' definition proposed by Ascui and Lovell (2011) in Table 1 below, where carbon accounting can be understood as any combination (reading left to right) of one or more terms from each cell in the table:

Table 1: Definition of carbon accounting from Ascui and Lovell (2011: 980)

estimation calculation measurement monitoring reporting validation verification auditing	of	carbon carbon dioxide greenhouse gas	emissions to the atmosphere removals from the atmosphere emission rights emission obligations emission reductions legal or financial instruments linked to the above trades/transactions of any of the above impacts on climate change impacts from climate change	at	global national sub-national regional civic organisational corporate project installation event product supply chain	level, for	mandatory voluntary	research compliance reporting disclosure benchmarking auditing information marketing or other	purposes

By combining terms in this way, more specific definitions can be derived and related to different forms of carbon accounting: for example, physical carbon accounting is primarily concerned with *estimation* or direct *measurement* of *greenhouse gas emissions* and *removals*, primarily at the *global* level, for *research* purposes, whereas carbon disclosure mainly involves *reporting* of *greenhouse gas emissions* and *impacts from climate change* at the *organisational/corporate* level, for *voluntary disclosure* purposes (Ascui and Lovell, 2011: 980). Even such an expanded definition is inevitably incomplete: for example, although monetary factors are implied in the references to financial instruments, trades and transactions, there are further ways in which monetary values might be considered in organisational carbon management accounting, for example in terms of introducing a cost of carbon into capital budgeting or operational cost accounting (Burritt et al., 2011). Likewise, beyond *estimating* and *reporting* on the *impacts from climate change* on an *organisation*, carbon accounting could also be understood to encompass monitoring and disclosure of the strategic management actions taken to address those impacts. Equivalent issues at the global or national level might include the current thorny challenges associated with monitoring climate finance flows (Buchner et al., 2011; Huhtala et al., 2010) or national implementation of climate policies. Finally, economic activity classifications could be added to the list of 'levels' or system boundaries applied to carbon accounting, as performed for example by Eurostat or the OECD.[2] We will return to elements of this expanded definition in our discussion of the different communities involved in carbon accounting in section 3.1 below.

2 Research method and theory

This paper explores new phenomena in an emerging and rapidly evolving field of research (carbon accounting) which is as yet under-theorised (Ascui and Lovell, 2011; Hopwood, 2009; Lovell et al.,

[2] See for example http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Air_emissions_accounts_statistics (accessed 3 November 2011). We are grateful to an anonymous reviewer for pointing this out.

2010; Lovell and MacKenzie, 2011; MacKenzie, 2009). Our approach is therefore based on grounded theory (Strauss and Corbin, 1998). Rather than testing a pre-defined theoretical framework, we first explored the data, then searched for theories which could help us understand our observations, and finally, in comparing the fit between potentially applicable theories and our observations, we have arrived at a number of conclusions regarding further development of these theories with respect to carbon accounting.

Our primary empirical material includes a large corpus of 'grey' literature on carbon accounting (as well as a smaller, but rapidly expanding, volume of academic literature commenting on the subject), transcribed interviews (12) and notes from participant observation. The literature was compiled through a combination of standard electronic search techniques and informal collection arising from one of the authors' experience as a practitioner involved in a wide variety of national, corporate, project and product-level carbon accounting over the last twelve years. Twelve interviews were conducted since November 2008 with key industry players active in carbon accounting from the 'Big Four' global accountancy firms (PwC, KPMG, Deloitte and Ernst & Young), carbon accounting bodies such as the Carbon Disclosure Project (CDP) and Climate Disclosure Standards Board (CDSB), accounting standard setters including the International Accounting Standards Board (IASB) and Financial Accounting Standards Board (FASB) and accountancy professional bodies such as the Institute of Chartered Accountants in England and Wales (ICAEW) and the Association of Chartered Certified Accountants (ACCA). These interviews were transcribed and coded using the qualitative data software, 'ATLAS'. The paper also draws on findings from research conducted by one of the authors on financial accounting in the EU Emissions Trading System (EU ETS), involving a review of the financial statements of 26 large companies and follow-up interviews with accountants at five of these companies. In addition, our case study on the CDSB is informed by participant observation of one of the authors as a member of the CDSB Technical Working Group since early 2009, and email correspondence with Working Group members.

Having reviewed this empirical material, focussing specifically on claims to competence in carbon accounting, we then considered a number of theoretical frameworks which appeared to be relevant. Two frameworks which we decided not to use after initial consideration were stakeholder theory and framing. In the case of stakeholder theory (Freeman, 1984; Frooman, 1999; Mitchell et al., 1997), this was because of the rather narrow focus on stakeholder influence on *organisations,* and managerial responses to this, rather than on the relationship between different communities of stakeholders with respect to a *field* or *domain* such as carbon accounting. The concept of framing was found useful to help explain how different groups of people define an issue in ways that make it understandable and solvable to them (and therefore exclude others, whether intentionally or otherwise), but as it has already been applied to carbon accounting elsewhere (Ascui and Lovell, 2011), in this paper we use the concept of framing as a stepping-stone towards other potentially useful theoretical frameworks.

We do not claim to have considered all potentially applicable theories, nor do we wish to imply that any rejected theory might not still yield useful insights on certain aspects of the observed phenomena. Rather, through an iterative inductive process, we have arrived at two theoretical concepts – epistemic communities and boundary-work – which we believe can be combined to provide a better understanding of some recent developments in carbon accounting – in particular, the emergence of the CDSB and its Climate Change Reporting Framework (Climate Disclosure Standards Board, 2010). These distinct yet related theoretical concepts have been drawn from the fields of international relations and the sociology of science. Each, in their own way, contributes to an understanding of the way in which different communities involved in carbon accounting are making claims to expertise and competence in this area. We first provide a brief explanation of each concept below, before discussing how it can be applied to the empirical evidence in section 3.

2.1 Epistemic communities

The concept of 'epistemic communities' derives from the study of policy change within the field of international relations, where its contemporary use was defined by Haas in a special issue of *International Organization* on epistemic communities in 1992 (Adler and Haas, 1992; Haas, 1992a; Haas, 1992b). The term in fact appears to have been coined by Ruggie in 1975 and has roots in Foucault's use of the word *episteme* to refer to "a dominant way of looking at social reality, a set of shared symbols and references, mutual expectations and a mutual predictability of intention. Epistemic communities may be said to consist of interrelated roles which grow up around an *episteme*; they delimit, for their members, *the* proper construction of social reality" (Ruggie, 1975: 569-570; italics in the original). Other influences include Kuhn's broader concept of a paradigm, or "an entire constellation of beliefs, values, techniques, and so on shared by members of a given community" which governs "not a subject matter but a group of practitioners" (quoted in Haas, 1992b: 3). Haas' definition is narrower and more specific: for him, an epistemic community is: "...a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area." For Haas, an epistemic community must have the following four key features: shared normative or principled beliefs, shared causal beliefs, shared notions of validity of knowledge in the domain of their expertise, and a common policy enterprise, defined as "a set of common practices associated with a set of problems to which their professional competence is directed..." (Haas, 1992b: 3).

The combination of these criteria distinguishes Haas' definition from earlier variants, and is used to explain the influence in political decision-making of networks of 'experts', particularly (but not only) at the transnational level. Essentially, the argument is that when formal actors (i.e. the political representatives of nation-states) have to deal collectively with uncertain and technically complex policy challenges such as depletion of the ozone layer or human-induced climate change, they tend to rely on technical experts with recognised expertise and competence in that particular domain. If these experts are part of an epistemic community according to the above definition, their shared beliefs and common policy enterprise are likely to lead them – with or without coordination – to give similar advice to their respective national formal actors. In this way power can be transferred from the formal (government) actors to external knowledge-based elites. However, it is worth noting that the ability of an epistemic community to influence policy is constrained by various other factors: for example, Adler and Haas point out that an epistemic community is more likely to be influential at the transnational level if it is already influential at the national level (Adler and Haas, 1992), and the extent to which state behaviour ends up reflecting an epistemic community's preferences "remains strongly conditioned by the distribution of power internationally" (Haas, 1992b: 7).

Haas and others stress that members of a profession or discipline do not necessarily form an epistemic community unless they share both principled and causal beliefs. The example is given of economists, who form a profession but not necessarily an epistemic community, whereas the sub-set of Keynesian economists may qualify as such (Haas, 1992b: 19). A community does not necessarily require articulated or even conscious policy intentions in order to propose convergent policy solutions: rather, "A community's advice... is informed by its own broader worldview" (Haas, 1992b: 4). This suggests that an epistemic community's common policy enterprise may arise from shared framing of problems and, therefore, perceiving (and therefore advocating) a limited range of possible solutions, based on their shared causal beliefs and common practices. Adler and Haas (1992: 375) explicitly note that epistemic communities exert influence on policy innovation by "(1) framing the range of political controversy surrounding an issue, (2) defining state interests, and (3) setting standards." Likewise at the policy selection stage, an epistemic community can "frame the issue and help define the decision makers' interests" (Adler and Haas, 1992: 381).

While the concept of epistemic communities was originally formulated in the context of scientists influencing policy, it has been extended to other communities such as monetary experts (Verdun, 1999) and accountants (Burritt, 1995).

A final point that is worth noting from this literature is the importance of what we might describe as techniques of demonstrating and defining authority in order to provide access to the policy arena:

> "The epistemic community members' professional training, prestige, and reputation for expertise in an area highly valued by society or elite decision makers accord them access to the political system and legitimize or authorize their activities. Similarly, their claims to knowledge, supported by tests of validity, accord them influence over policy debates and serve as their primary social power resource. At the same time, the professional pedigrees and validity tests set the community members apart from other social actors or groups and not only serve as a barrier to their entry into the community but also limit the influence that these other actors or groups might have in the policy debate." (Haas, 1992b: 17).

The latter activity, setting a community apart from other actors or groups and enhancing the community's influence at the expense of others, is considered more closely in the context of boundary-work in the next section.

2.2 Boundary-work

The concept of 'boundary-work' originates in the sociology of science, where it was first formulated to describe strategic behaviour or "rhetorical style" employed by scientists with the aim of creating distinctions between science and non-science (Gieryn, 1983: 782). By drawing attention to the discursive activities by which boundaries are established, maintained and adapted over time, difficulties in identifying essential characteristics of science are circumvented, and the social construction of such characteristics is explicitly acknowledged. It was recognised at an early stage that the concept of boundary-work could be applied to other demarcations, for example between disciplines or professions. Gieryn identifies three generic rhetorical devices relevant to the activity of "professionalization":

> "(a) when the goal is *expansion* of authority or expertise into domains claimed by other professions or occupations, boundary-work heightens the contrast between rivals in ways flattering to the ideologists' side; (b) when the goal is *monopolization* of professional authority and resources, boundary-work excludes rivals from within by defining them as outsiders... (c) when the goal is *protection of autonomy* over professional activities, boundary-work exempts members from responsibility for consequences of their work by putting the blame on scapegoats from outside." (1983: 791-2).

Reacting to the potential instability created by boundary-work (blurring of boundaries, precisely due to their uncertain and ambiguous social construction), Guston (2001) turns his attention to "boundary organizations" as linking and stabilising institutions. A boundary organisation draws its membership from actors from both sides of the boundary (traditionally, between science and politics), but importantly also includes "professionals who serve a mediating role" (Guston, 2001: 401). Being thus constituted enables boundary organisations to perform a unique role that would be difficult or impossible for organisations based on either side of the boundary. In contrast to the oppositional rhetoric identified by Gieryn above, Guston (2001) and others (e.g. Jasanoff, 1990; Miller, 2001; Shackley and Wynne, 1996) find that boundary organisations, and other associated devices, can serve to reconcile tensions and lead to more productive policy-making.

In this necessarily brief summary of the concepts of epistemic communities and boundary-work, we hope to have shown that each is useful to help understand the ways in which the beliefs, practices

and discourse of professional communities shape their perceptions of the world around them and in turn influence their proposed solutions to new problems; how this propagates into policy-making; and how such communities negotiate their interactions with other communities. In the next section we use these ideas to examine the different communities involved in the field of carbon accounting. We then focus in more detail on the role played by accountants in extending claims of ownership and expertise in this field, and finally examine the emergence of standards and specifically the role and nature of the Climate Disclosure Standards Board as a boundary organisation linking two carbon accounting communities.

3 Results and discussion

3.1 Communities involved in carbon accounting

A number of efforts have recently been made to theorise carbon accounting at a sufficiently high level to encompass different kinds of carbon accounting carried out by different communities. Guenther and Stechemesser (2011), on the basis of a systematic literature review, divide the literature into four categories: physical carbon accounting with a focus on the global and national level; physical carbon accounting with a focus on carbon footprinting; monetary carbon accounting with a focus on management accounting; and monetary carbon accounting with a focus on financial accounting. Bowen and Wittneben (2011: 1024) divide carbon accounting into three arenas or organisational fields "where organisations vie for power devising carbon accounting methodologies and systems" and denote these "counting carbon" (involving scientists and scientific organisations); "carbon accounting" (involving specialised carbon accounting organisations and accounting firms); and "accountability for carbon" (involving transnational and national, governmental and non-governmental organisations contesting the allocation of emission reduction responsibilities). Ascui and Lovell (2011) distinguish five major framings of carbon accounting: physical, political, market-enabling, financial and social/environmental. In Table 2 we summarise how the categories used in these three papers relate to one another (noting that in practice there is some blurring of boundaries: the vertical delineations are not quite as clear-cut as Table 2 implies).

Table 2: Categorisations of carbon accounting

Typical scope	**Global**	**National**	**National, installation or project**	**Organisation**	**Organisation, product, event or supply chain**	
Ascui and Lovell (2011)	Physical	Political	Market-enabling	Financial	Social/environmental	
Guenther and Stechemesser (2011)	Physical with a focus on global and national level			Monetary with a focus on financial accounting	Physical with a focus on carbon footprinting	Monetary with a focus on management accounting
Bowen and Wittneben (2011)	"Carbon counting"	"Carbon accountability"		"Carbon accounting"		

There are notable similarities as well as some important differences between these interpretations. Firstly, there is general agreement that physical carbon accounting, conducted primarily by scientists and scientific organisations, is a distinct field. However, Guenther and Stechemesser (2011) include both global and national level physical carbon accounting within the same category, which we feel does not distinguish between the essentially political nature of national-level carbon accounting (which arises mainly as a response to the 1992 United Nations Framework Convention on Climate Change (UNFCCC) (United Nations, 1992)) and global, scientific carbon accounting, which strives to be apolitical (despite the obvious challenges associated with such an objective). This is the classic

science-policy interface, straddled by boundary organisations such as the Intergovernmental Panel on Climate Change (IPCC), which in addition to mediating between climate science and politics (Fogel, 2005; Miller, 2001) has a specific role in providing the "comparable methodologies" which countries must follow for national carbon accounting under the UNFCCC (Article 4.1 (a)).

What Ascui and Lovell (2011) term 'political' carbon accounting under the UNFCCC differs from scientific measurements in being bottom-up, usually based on existing national statistics for factors such as fuel consumption, deforestation rates and numbers of livestock, combined with assumed emission factors per unit of each activity, as opposed to top-down direct monitoring of the atmosphere. In addition, various sources of physical emissions are excluded from national carbon accounts for purely political reasons: natural sources of greenhouse gases, emissions associated with international air and maritime transport, and greenhouse gases which are controlled separately under the Montreal Protocol. The actors involved in 'political' carbon accounting include both physical carbon accounting specialists and government officials, although in practice much of the government role is often contracted out to technical consultants: for example, in the UK, the national greenhouse gas inventory is compiled by sustainability consultants AEA, with inputs from two scientific research centres.[3] National political representatives act as 'gate-keepers' controlling participation in 'political' carbon accounting: for example, a candidate for the UNFCCC Roster of Experts in the area of greenhouse gas inventories must be nominated by a National Focal Point (official government representative) according to specified criteria which include relevant scientific and technical expertise, academic or professional qualifications and at least five years of experience.[4] To date, accountants from the 'Big Four' global accountancy practices have not generally been heavily involved in 'political' carbon accounting.

Bowen and Wittneben (2011) likewise put the scientific ("counting carbon") into a separate category to the political ("accountability for carbon"). However, they also include what Ascui and Lovell (2011) term 'market-enabling' carbon accounting within the latter. While carbon markets are undoubtedly largely driven by government decisions to accept and allocate responsibilities for climate change, we would argue that the use and acceptance of market mechanisms has opened the door to considerable influence by non-state actors and the emergence of entirely new forms of climate change governance (Hoffmann, 2011; Okereke et al., 2009), leading to distinct new forms of carbon accounting. This is most clearly visible in the voluntary carbon market, which by definition exists outside the scope of direct government policy and regulation, but similar trends can also be discerned within policy-driven markets such as the Clean Development Mechanism (CDM) (Lovell et al., 2009).

Although carbon markets were originally conceived at the national level (via the Kyoto Protocol) most of the accounting involves monitoring, reporting and verification at the project or installation level (generally, project-level accounting is associated with baseline-and-credit schemes such as the CDM, whereas installation-level accounting is associated with cap-and-trade schemes such as the EU ETS). The project level is particularly interesting, because what is being accounted is no longer just *emissions* and *rights to emit*, it is *emission reductions* and the associated carbon credits or offsets (which have a value to the extent that they can be translated into rights to emit somewhere else). The need to ensure that such emission reductions are real and additional to any that would have happened in the absence of the project activity has spawned a vast body of complex rules and project-level carbon accounting procedures, including a unique apparatus for carbon validation and verification (audit) functions.[5] While 'market-enabling' (i.e. Kyoto Protocol) accounting at the national level is essentially a variant of 'political' carbon accounting, involving similar actors, the

[3] See http://ghgi.decc.gov.uk/compilation.html (accessed 10 December 2010).
[4] See http://unfccc.int/parties_and_observers/roster_of_experts/items/534.php (accessed 10 December 2010).
[5] See for example the online rulebook available at http://cdmrulebook.org/ (accessed 18 December 2009).

actors involved in market-enabling carbon accounting at the project level are new and diverse, represented by organisations such as the International Emissions Trading Association (IETA), CDM Project Developer Forum and Carbon Markets and Investors Association (CMIA).[6] All of the 'Big Four' global accountancy firms are members of IETA, and KPMG and PwC are also members of CMIA. However, their engagement has not been uniform: for example, only PwC has had significant direct involvement in the preparation of new project-level carbon accounting methodologies, proposing 14 out of 339 new methodologies for large-scale emission reduction projects considered by the CDM Executive Board up to the end of March 2011 (KPMG was peripherally involved in a further two proposals).[7] This work is also not evenly distributed: although PwC has acted as consultant for the development of project design documents for 117 emission reduction projects, making it the sixth most experienced consultant by number of projects[8], this work is concentrated almost exclusively in the PwC India office. In general, it is probably fair to say that the involvement of the accountancy profession in market-enabling carbon accounting has mainly been on a rather ad-hoc consultancy basis, reflecting their broad transactional experience rather than a claim for specific expertise in this type of carbon accounting.

The imposition of a price on carbon at the project or installation level through emissions trading schemes creates a need for new carbon assets, liabilities and financial flows to be accounted for in affected companies' financial statements (Cook, 2009; Lovell et al., 2010; MacKenzie, 2009). This form of financial carbon accounting is put in a category of its own by Guenther and Stechemesser (2011), and by Ascui and Lovell (2011), but is included together with other forms of organisational carbon accounting (including carbon footprinting) by Bowen and Wittneben (2011). Our primary interest in different categories of carbon accounting is to identify the different communities involved, particularly in terms of the professional identity of the people who carry out and/or define the scope of the relevant accounting activity. We therefore find the distinction between financial carbon accounting and other forms of organisational carbon accounting useful, because the former is indisputably associated with and carried out by the (financial) accountancy profession (we expand on this in section 3.2 below).

Within the scope of organisational carbon accounting, Guenther and Stechemesser (2011) distinguish between physical carbon footprinting and monetary carbon accounting, with the latter further sub-divided into management accounting and financial accounting. This follows the well established approach to distinguishing between physical and monetary environmental management accounting (EMA); and between accounting information produced for internal (management) versus external accounting and reporting purposes (Burritt et al., 2002; Schaltegger et al., 2006; Schaltegger and Burritt, 2010). We summarise what we believe are the key forms of organisational carbon accounting (all of which fall within the broad scope of what Ascui and Lovell (2011) term 'social/environmental' carbon accounting) in Figure 1 in section 3.3 below. For reasons which will become clearer during our discussion of the Climate Disclosure Standards Board in section 3.3, we suggest that the collection, processing and reporting of strategic carbon management information should be considered an intermediate or overlapping category, as it typically involves a combination of both physical and monetary measures. We have termed this 'strategic carbon management accounting' when the focus is internal, and 'climate risk, opportunity and governance disclosure' when the focus is external. To some extent the former category also recognises a call made by Ratnatunga and Balachandran (2009) to distinguish between carbon-related cost management and strategic management accounting activities.

[6] See http://www.ieta.org/, http://www.pd-forum.net/ and http://www.cmia.net/ respectively (accessed 10 December 2010).
[7] Based on data from UNEP Risoe Centre CDM Pipeline spreadsheet, available at http://cdmpipeline.org/publications/CDMPipeline.xlsx (accessed 1 April 2011).
[8] Ibid.

Burritt et al. (2011) apply the EMA model to internal carbon management accounting, allowing further distinctions to be drawn not only on the basis of physical and monetary dimensions, but also according to the time-frame of decision-making, the length of time-frame, and the routineness of the information supplied (we have selected two key terms within this framework – 'carbon flow accounting' and 'carbon cost accounting' within our Figure 1). One of their empirical observations (based on interviews with a set of 10 large German companies) is that many different functional managers within an organisation may be involved in collecting, processing and acting on both physical and monetary carbon-related information. Although such functional managers (typically energy, environment/sustainability or carbon managers) are in effect carrying out accounting functions, they would generally not identify themselves as accountants, and in fact a unifying, coordinating role (which might be played by accountants) is typically absent (Burritt et al., 2011). This observation supports earlier work which has found little or no standardisation of approaches within organisational carbon management (Kolk et al., 2008; Kolk and Pinkse, 2005).

Turning to external, physical carbon accounting (or footprinting), we observe that although accountants have had some involvement in the development of standards in this area, a wide range of other actors have also been active. For example, of nearly 350 acknowledged contributors to the 2001 edition of the main industry standard for corporate carbon footprints, the GHG Protocol, only 21 can be clearly identified (by their organisational affiliation) as professional accountants (World Business Council for Sustainable Development and World Resources Institute, 2001). Amongst the broader field of contributors, accountants are outnumbered by specialist carbon footprinting companies (usually small to medium size) and share the platform with general management consultancies and engineering consultancies, as well as a host of non-governmental organisations (NGOs), government agencies, intergovernmental bodies, trade associations, research institutions and (mainly carbon intensive) businesses. Anecdotal evidence as well as personal experience in the carbon footprinting market suggests that this is also a reasonable reflection of the range of actors who have subsequently carried out carbon footprinting. Over time, there has been some degree of evolution from dominance by small specialist consultancies, NGOs or research institutions (commonly brought in to help undertake the first footprint of an organisation or product) through to this becoming incorporated within the organisation's routinely generated internal management accounting. At the same time, carbon footprinting has also become a standard component of the services provided by the advisory arms of the global accountancy firms (which have in certain cases acquired small carbon footprinting specialists for this purpose[9]), and by various general management and engineering or environmental consultancies.

Similarly, the fast-growing field of product carbon footprinting and labelling was initially dominated by technical specialists and supported by quasi-government bodies such as the UK's Carbon Trust (Sinden, 2009), but now can be found as a standard service offered by accountancy firms such as Deloitte.[10] Ascui and Lovell (2011) point out that product carbon footprinting has a slightly different pedigree to organisational carbon footprinting, as it has evolved mainly from the practice of Life Cycle Analysis (LCA), which is associated with a more specialised technical competence than organisational carbon footprinting. Thus product and supply chain carbon footprints tend to be carried out by specialist consultancies, working with technical staff within organisations responsible for buying or manufacturing the products in question.

In conclusion, we hope to have shown from this brief review that carbon accounting clearly involves a number of quite different activities, carried out by different communities. This leads to uncertainty and flexibility in terms of what carbon accounting is understood to mean, how it should be done and

[9] For example, one of the stated purposes of the acquisition of dcarbon8 by Deloitte in March 2010 was to "provide Deloitte a route into the market for carbon footprinting services" (Datamonitor, 4 March 2010).
[10] See http://www.deloitte.com/view/en_GB/uk/market-insights/sustainability-services/climate-change-and-carbon-management/carbon-footprinting-and-reduction-services/index.htm (accessed 24 October 2011)

who should be involved. Looking more specifically at organisational carbon accounting, we see a clear distinction between financial reporting of carbon assets and liabilities created under emissions trading schemes, which is indisputably the domain of accountants, and other forms of organisational carbon accounting, where accountants share the field with a range of specialist and generalist consultancies as well as internal functional managers. After financial carbon accounting, the various forms of internal carbon management accounting might be assumed to be the logical place for deployment of traditional accountancy expertise, but as Burritt et al. (2011) note, there is little evidence of this, as yet. On the other hand, accountants have been competing more actively with other specialists in physical, external carbon accounting, and as we will show in section 3.3, particularly in the emerging field of climate disclosure. A possible explanation may be that external pressure to disclose, driven by demands from regulators, investors or other stakeholders, is the most important driver of carbon accounting activity at present, while routine internal management controls have yet to catch up with and incorporate these new developments.

In the next section we explore the discursive positioning of the accountancy profession with respect to carbon accounting, and the rhetorical devices (boundary-work) being employed to extend the boundaries of their expertise and to influence policy. Finally, in section 3.3, we examine how pressure from investors and other stakeholders on organisations to disclose both physical carbon emissions and carbon management activities has led to convergence and the emergence of a new standard for climate disclosure, which has opened up a new opportunity for the accountancy profession.

3.2 Accountants and carbon accounting

Lovell and MacKenzie (2011) characterise the period from the late 1990s to 2005 as one of 'reluctant engagement' of accountants with climate change. During this period, detailed technical debate on financial carbon accounting took place largely behind closed doors and without drawing links to the wider issue of responding effectively to climate change. For example, in November 2003 the Emerging Issues Task Force (which advises FASB, the US-based Financial Accounting Standards Board) met to discuss *Issue no. 03-14, Participants' Accounting for Emissions Allowances under a "Cap and Trade" Program*, and considered it relatively non-contentious, removing it from the agenda after a single meeting. In fact, some members indicated that "they did not perceive a practice issue or diversity in the accounting for emissions trading programs" (FASB Emerging Issues Task Force, 2003: 76).

At the same time, a number of accountancy professional bodies were working to raise their members' awareness of climate change and other sustainability accounting issues more generally. ICAEW's 2004 report *Sustainability: The role of accountants* included an entire chapter on tradable permits, with sections on recognition, measurement and reporting (both in physical and financial terms), concluding that:

> "At present, very few professional accountants are familiar with the [these] schemes… and there is a challenging opportunity for the profession to contribute to the development and implementation of policy at all levels, as well as standards for accounting and reporting… Whilst the initial measurement is a matter for other specialists, there will be a substantial role for accountants in reviewing information, assessing the implications and contributing to the operation of related markets." (ICAEW, 2004: 66-67)

There was by no means an immediate response by the accounting profession to the ICAEW report, as illustrated in this October 2009 interview with the manager with responsibility for sustainability issues at ICAEW:

> "I suppose what we were doing with [the ICAEW (2004) report] was carving out a role for the profession, trying to identify it ... and saying to members "Look, here is a role for you, and *tell us what skills we need to build for you so you can occupy it.*"
>
> Interviewer: And what sort of a reaction did you get?
>
> Well, I'd say four and a half years ago the reaction was puzzled bemusement! I think members struggled—and still do to an extent—to see what their role is..." (quoted in Lovell and MacKenzie, 2011: 715)

In summary, during this first phase, efforts can be discerned, led by accountancy professional bodies, to re-frame the issue (i.e. "policy innovation," in the language of epistemic communities), but without managing to achieve the next step of "policy diffusion" (Adler and Haas, 1992).

Since 2005, however, the pace of policy diffusion activities such as the publication of reports, development of standards and growth in disclosure initiatives has quickened, in what Lovell and MacKenzie term the 'strategic engagement' phase. A key factor in this transition was the controversy generated by the publication by the International Accounting Standards Board (IASB) of *IFRIC Interpretation 3: Emission Rights* (IFRIC-3) in late 2004, which elevated financial carbon accounting from a technical issue discussed in meetings of accounting standards bodies to a very real issue for thousands of practicing accountants in European companies, with significant financial implications (for a full explanation, including how IFRIC-3 was withdrawn six months later, see Cook (2009)). This in turn drew the attention of the 'Big Four' accountancy firms, which published reports promoting their advisory competence in this area (Deloitte, 2007; KPMG, 2008; PricewaterhouseCoopers and IETA, 2007). Although these firms had been involved in carbon management consultancy services for some time (see for example PricewaterhouseCoopers, 2007), the IFRIC-3 controversy brought carbon to the attention of more mainstream financial accountants within these firms. This was in keeping with a broader strategic drive on the part of the 'Big Four' to engage in organisational carbon accounting, particularly in relation to carbon disclosure (where, for example, PwC took over the role of compiling annual CDP reports from a small specialist investment research firm, Innovest Strategic Value Advisors, in 2008).

Increasingly since 2005, there is evidence of accountants discursively representing themselves as qualified managers of carbon, and accountancy as 'the natural home' for governing the new low-carbon economy. For example the Association of Chartered Certified Accountants (ACCA) boldly state in their 'Carbon Jigsaw' report that:

> "At some stage in the next 12 months… every major business can expect to be asked about its greenhouse gas emissions and its mitigation strategy…. To respond to such questions and to demonstrate action, businesses will need to involve accountants. *In the future, it will be the role of accountants to represent carbon-related actions in financial accounting terms in the annual reporting process*." (ACCA, 2009: 8, emphasis added).

Here we can discern three devices at work: first, a broad rhetorical assertion of relevance ("businesses will need to involve accountants"); second, a re-statement of the problem in terms of an existing area of relatively uncontested expertise (financial accounting and annual reporting); and third, a re-affirmation of competence in the redefined arena ("it will be the role of accountants to represent carbon-related actions"). More generally, in this way the problem of climate change is framed primarily as a corporate one, with accountants as central in providing both strategic and practical responses. The Chartered Institute of Management Accountants (CIMA) recently made an even stronger claim in its report *Accounting for climate change: How management accountants can help organisations mitigate and adapt to climate change*:

> "Management accountants have a key role to play in driving sustainable strategic and operational decisions... Failure for management accountants to get involved now, when key decisions are being taken in areas like carbon trading and compliance with new climate change related regulations, could result in far higher costs, lost opportunities or reduced competitiveness."(Chartered Institute of Management Accountants, 2010: 2)

Framing climate change as a corporate problem that can be managed by accountants has a certain allure. It emphasises uncertainty and complexity, and promises a resolution of these difficulties through the application of core accountancy skills. There are certainly echoes here of the application of that characteristic "set of common practices associated with a set of problems to which their professional competence is directed" of an epistemic community (Haas, 1992b: 3).

We turn now to a specific case study that illustrates the interactions between a community of accountancy professionals and a group of NGOs with a common interest in social/environmental disclosure, leading to the creation of a new boundary organisation linking these communities and setting a new standard for combined physical and non-physical organisational carbon accounting: the Climate Disclosure Standards Board.

3.3 Climate Disclosure Standards Board (CDSB) case study

The CDSB was formed at the World Economic Forum in 2007 by a group of influential non-governmental organisations: the Carbon Disclosure Project, Ceres, World Resources Institute, World Economic Forum Global Greenhouse Gas Register, California Climate Action Registry, The Climate Group and the International Emissions Trading Association (World Economic Forum, 2007).

It is worth examining these stakeholders in further detail. The **Carbon Disclosure Project** (CDP), which acts as Secretariat to the CDSB, is one of the great success stories of social/environmental carbon accounting. Founded in 2000 by Paul Dickinson, an actuary and entrepreneur, and Tessa Tennant, a pioneering green investment fund manager, the CDP is essentially an environmental pressure group that seeks to influence corporate behaviour by requesting disclosure of carbon (and, more recently) water management accounting information, on the assumption that measurement will lead to better management. It exerts influence by building and then acting on behalf of a coalition of investors, starting with a group of 35 investors representing US$4.5 trillion in assets in 2002, which had grown to 534 investors representing US$64 trillion in 2010 (Innovest Strategic Value Advisors, 2002; PricewaterhouseCoopers, 2010). In recent years, the CDP has also allied itself with major purchasing organisations such as Walmart, thus exerting supply chain pressure in addition to investor pressure. **Ceres** is a similar US-based counterpart, founded in 1989 and one of the founders (in 1997) of the Global Reporting Initiative (GRI), now the de facto standard for sustainability reporting. Ceres had previously collaborated with CDP, GRI, and other organisations to produce a *Global Framework for Climate Risk Disclosure: A statement of investor expectations for comprehensive corporate disclosure* (Ceres, 2006). The **World Resources Institute** describes itself as a "global environmental think tank" and is one of the two founders of the GHG Protocol, now the de facto standard for physical carbon accounting for organisations, recommended as the basis for carbon accounting under both the GRI and CDP (World Business Council for Sustainable Development and World Resources Institute, 2004). The now-defunct **World Economic Forum Global Greenhouse Gas Register** was a similar initiative to the CDP, launched in 2003 in partnership with several of the same stakeholders as the CDSB (WRI, IETA and California Climate Action Registry as the operator of the registry) as well as other similar organisations such as the World Business Council on Sustainable Development (WBCSD, the other founder of the GHG Protocol), the Pew Centre for Global Climate Change (another influential environmental think tank), the World Wildlife Fund and – making a solitary appearance in this inter-related set of environmentally-oriented organisations, one of the

'Big Four' accountancy firms – Deloitte. The **California Climate Action Registry** (now transitioned to the Climate Registry) was a similar voluntary carbon accounting and disclosure initiative based in the state of California. **The Climate Group** is another very influential coalition-based environmental pressure group, founded in 2004, and in turn a founder (with IETA, the World Economic Forum and, shortly afterwards, WBCSD) of the Voluntary (now Verified) Carbon Standard, currently the most popular project-level carbon accounting standard in the voluntary carbon offset market (Hamilton et al., 2010). Finally **IETA**, established in 2000, represents key industry players in the market-enabling carbon accounting world, as mentioned in section 3.1 above.[11]

These stakeholders clearly have the characteristics of a small, closely-knit epistemic community. They share values or principled beliefs (which perhaps we can best characterise as business-savvy environmentalism); causal beliefs (for example, investor pressure for disclosure → measurement → better management of environmental issues); shared notions of validity (for example, mutual recognition of standards) and a common policy enterprise, seen not least in their support for development of standards and promulgation of these into government policy. To take just one example of the latter, The Climate Group's website proudly lists among its achievements that it "...helped push through California's landmark Assembly Bill 32, making it mandatory for businesses to report and cut greenhouse gas emissions..."[12]

So what was this epistemic community aiming to achieve with the founding of the CDSB? The founding press release states an aim "to establish a generally accepted framework for climate risk-related reporting by corporations. ... CDSB member organizations have agreed to align their core requests for information from companies in order to ensure that they report climate change-related information in a standardized way that facilitates easier comparative analysis by investors, managers and the public." (World Economic Forum, 2007).

The members of this social/environmental carbon disclosure community are not, in general, accountancy professionals. Yet they share a common financially informed, business-savvy background, and clearly from the outset saw the involvement of accountancy professionals as instrumental in creating a corporate carbon accounting framework that would be global and mainstream in nature. According to the CDSB Secretariat, close engagement with accountants has been an "absolutely deliberate strategy".[13]

This is reflected in how the CDSB has presented itself and its mission. It is no coincidence that "generally accepted" in the press release quoted above echoes Generally Accepted Accounting Principles or GAAP. Likewise, the CDSB's main output to date has been its Climate Change Reporting Framework, published in September 2010, which has been set out in a format similar to other financial reporting frameworks (Climate Disclosure Standards Board, 2010). Its early draft circulated for comments by the CDSB in May 2009 was termed an 'Exposure Draft', again echoing standard practice from accountancy standard setters, and noted that it was deliberately adopting "relevant principles and objectives of financial reporting" in order to provide a "workable filter" through which to view climate change issues (Climate Disclosure Standards Board, 2009: 7).

It is evident that involvement in this standard-setting initiative was welcomed by certain accountancy professionals, as the founding press release relates:

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[11] For more information on these organisations see http://www.cdproject.net; http://www.ceres.org/; http://www.globalreporting.org/; http://www.wri.org/; http://www.greenbiz.com/news/2003/12/09/world-economic-forum-creates-global-greenhouse-gas-register; http://www.climateregistry.org/; http://www.theclimategroup.org/; http://www.v-c-s.org/; http://www.ieta.org/ (accessed 10 Dec 2010).

[12] http://www.theclimategroup.org/about-us/achievements/ (accessed 10 Dec 2010).

[13] Interview with CDSB core member, July 2009.

> ""Climate change and the implications on business process and disclosure are finally becoming the topic of discussion that they deserve to be. Ernst & Young and PricewaterhouseCooopers are enthusiastic and supportive participants in this dialogue," said Paul Ostling, Ernst & Young Global Chief Operating Officer, and Willem Brocker, PricewaterhouseCoopers Global Managing Partner." (World Economic Forum, 2007).

This enthusiasm has lasted: accountants have been heavily involved in the subsequent development of the CDSB and its Climate Change Reporting Framework. Structurally, the CDSB comprises a Board, an Advisory Committee and a Technical Working Group. While the Board (which represents the seven original founding partners) and Advisory Committee can be characterised as being largely drawn from the social/environmental carbon disclosure epistemic community (with representatives from business, legal firms, other investor pressure groups, and hybrid governmental-business organisations such as the Carbon Trust and UNEP Finance Initiative), the Technical Working Group comprises mostly accountants (at least 14 out of the 21 core TWG members), including individuals from all the 'Big Four' accountancy firms and five accountancy professional bodies (all ostensibly acting in a personal, rather than representative, capacity). Significantly, it is the Technical Working Group that actually produced the Climate Change Reporting Framework document (Climate Disclosure Standards Board, 2010: 1-2).

Why have accountants been so eager to be part of this initiative? Part of the answer seems to be that there has been a perceived 'gap in the market' in terms of a professional 'home' for this form of carbon accounting:

> "...with climate change related disclosure being such a new discipline, that hasn't really yet established its own body of professionals, there's a rather fragmented approach within organisations. Does it belong to the procurement department, the premises department, CSR [Corporate Social Responsibility]? You know, it doesn't belong anywhere."[14]

As discussed in section 3.1 above, physical carbon footprinting for organisations was until recently mainly dominated by relatively small, specialised consultancies, lacking almost any common sense of professional identity with which they might counter an extension of claims of competence by the accountancy profession in this area.[15] As the number of firms reporting to CDP has grown, from 235 in 2002 to 3050 in 2010, providing services in this area has undoubtedly become increasingly financially attractive (carbon measurement, management and reduction was identified as the number one opportunity area for UK consultants in a recent survey (ENDS, 2010) and in 2011 the UK Department for Environment Food and Rural Affairs (2011) consulted on the possibility of making greenhouse gas measurement and reporting mandatory for UK companies). Additionally, accountants have begun to see at least the *disclosure* aspect as a natural extension of their existing competence:

> "all four [major] accounting firms [Deloitte, PwC, KPMG, Ernst and Young] endorse CDSB's philosophy… and they have all been very active in their participation because it dovetails in with so much work that they are already doing anyway."[16]

[14] Interview with CDSB core member, July 2009.

[15] Very recently, a number of professional certification schemes have emerged in the key areas of carbon footprinting (also known as greenhouse gas inventory quantification) and verification, along with a number of new professional bodies, one of which (the GHG Management Institute) is represented on the CDSB Advisory Committee, but not the Technical Working Group. However, clearly this profession is still in its infancy with respect to the accountancy profession. See for example: http://www.csa-america.org/personnel_certification/ghgquantifier_certification/; http://epghg.org/; http://ghginstitute.org/; http://www.carbonprofessional.org/ and http://www.carbonanalyst.org/ (accessed 22 July 2011).

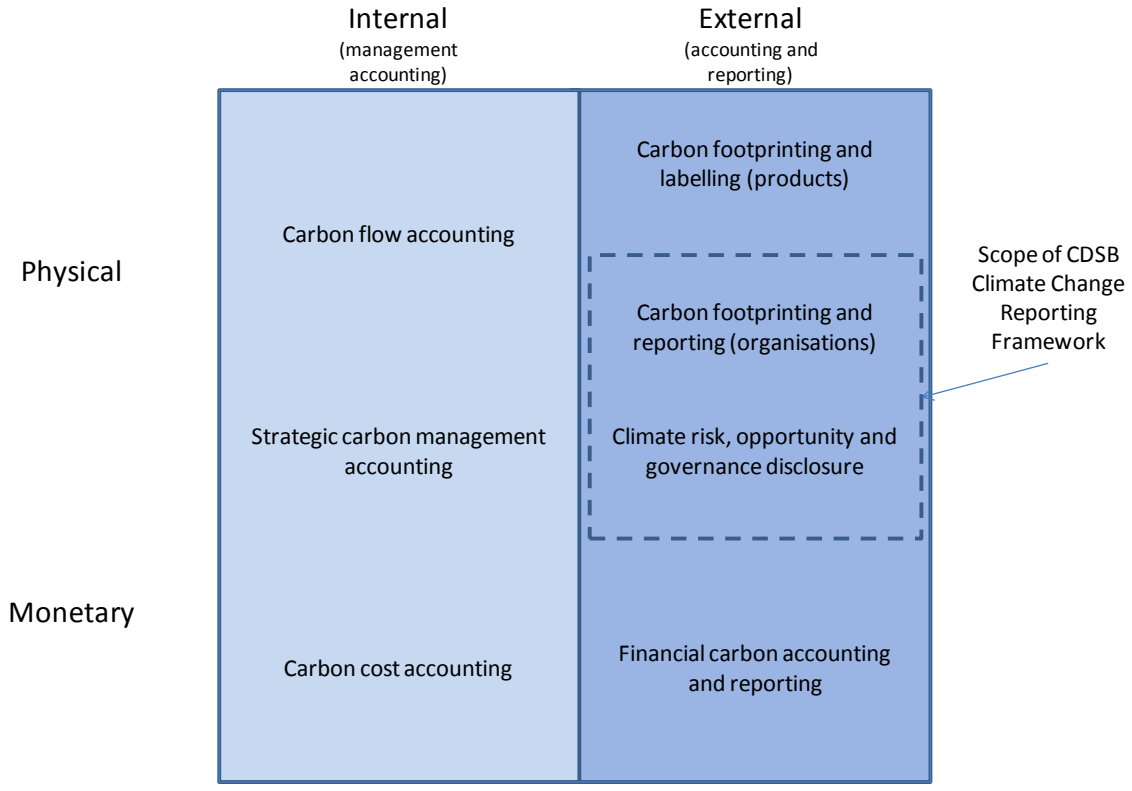
[16] Interview with CDSB core member, July 2009.

There is also some evidence that, as was observed in the case of environmental audit (Power, 1991; 1997) accountants are capitalising on their privileged access to management in order to position themselves between management and other 'technical' specialists:

> "I see quite a big distinction between carbon accounting – actually monitoring and reporting and assessing your greenhouse gas emissions and uncertainty levels and all that type of thing... [and] what you make of that [data]. I think the management has to look at that information in the same way that they would financial information and decide what to make of it and reflect their thinking in their management discussions. And we are focusing on the latter rather than the former."[17]

Interestingly, although consciously based on financial reporting principles (and therefore building on accepted accountancy competence and expertise), the Reporting Framework only requires disclosure of physical greenhouse gas emissions and strategic analysis of climate change risks, opportunities and governance (see Figure 1 below). It does not provide guidance on financial reporting of emission rights and liabilities, and in fact the CDSB has only recently become interested in addressing this issue, perhaps through development of a separate voluntary reporting standard.[18] It seems, therefore, that even while the accountancy profession is engaged in a strategic expansion of its domain, its internal divisions between financial and management accounting remain difficult to overcome.

Figure 1: Examples of key types of carbon accounting at the organisational level (adapted from Bartolomeo et al. (2000); Burritt et al. (2002, 2011))



Although the accountancy *profession* is now engaging strategically with carbon accounting, we do not believe that this engagement has yet reached the mainstream of rank-and-file accountants. The individuals involved in the CDSB Technical Working Group are a small, close-knit group of technical

[17] Interview with CDSB core member, July 2009.
[18] CDSB Technical Working Group discussions, November 2011.

experts drawn mainly from the four elite global firms, and from accountancy professional bodies which had already established a climate change leadership role (see section 3.2 above). Like the stakeholders on the CDSB Board and Advisory Committee, they too have the shared characteristics of an epistemic community, with the added dimension of all belonging to a clearly defined profession. Our research is ongoing in this area, but preliminary evidence suggests that this accountancy community shares some principled beliefs, such as a genuine concern about climate change, with the social/environmental carbon disclosure community; but their organisation and interests as a profession, as well as their financial interest in the outcome, sets them apart. Nevertheless, both communities have incentives to work together, with the social/environmental carbon disclosure community being apparently very willing to invite the accountants into their domain, in return for the benefits of mainstreaming carbon disclosure into corporate financial reporting. In summary, the CDSB appears to be a classic boundary organisation, drawing its membership from two separate epistemic communities and enabling each to extend their influence on organisational carbon accounting.

4 Conclusions

In this paper we have drawn attention to the politics of carbon accounting: who defines it, who claims to have competence in it, and how such claims are justified and reinforced. We have shown that multiple communities are involved in carbon accounting, each framing it in their own discourse, with their own standards, techniques and practices. We then focus on organisational carbon accounting, which can be further sub-divided into physical (carbon footprinting) and non-physical (monetary and strategic) dimensions, as well as according to whether it is produced for internal or external accounting and reporting purposes, as summarised in Figure 1 above.

Accountants have been involved in setting standards for physical carbon footprinting since at least 2001, but as only one of several different communities active in this field, and against a backdrop of initial reluctance and lack of awareness from rank-and-file members of the profession. Financial reporting of emission rights surfaced as a significant issue for large companies in the run-up to the 2005 start of the EU ETS, and highlighted an area of carbon accounting where accountants could indisputably claim competence. This occurred at roughly the same time as a broader strategic push by the accountancy profession into other forms of organisational carbon accounting, particularly the external disclosure and management interpretation of physical and strategic carbon-related information. Competence is also being claimed in virtually all aspects of internal carbon management accounting (Chartered Institute of Management Accountants, 2010) although the evidence to date suggests that accountants are not yet actively involved (Burritt et al., 2011).

The broader participation of accountants in carbon accounting has many positive aspects, and we hope to have shown that the interaction between the accountancy profession and the social/environmental disclosure community in forming the Carbon Disclosure Standards Board and producing the first Climate Change Reporting Framework has been productive, and beneficial for both sides. However, we believe that this initiative should not go un-scrutinised. The involvement of accountants and efforts to align the Climate Change Reporting Framework with financial reporting standards has led to the use of technical terminology and cross-referencing to other financial accounting concepts and documents which may serve as a barrier to non-accountants, both in terms of those who would provide carbon accounting services and in terms of the 'lay' user of such information. It is worth remembering that incorporating carbon accounting information in company financial reports is not the only way such information might be collated or presented: there are many other options, including radical alternatives such as the 'open-access' model pioneered by the environmental pressure group Sandbag, which presents site-specific emissions, allocations and offsets data derived from the EU ETS registry in an online map-based format.[19]

[19] See http://www.sandbag.org.uk/ (accessed 10 December 2010).

The implications of our findings for the theories we have used here – epistemic communities and boundary-work – are tentative; carbon accounting is a new field of enquiry and much change has taken place over the past few years, which will take time to evolve towards clearly dominant standards and practices. Professional training, expertise, shared language and practices have been critical to the conception and subsequent development of different frames of carbon accounting. Ideas about boundary-work therefore complement the broad scope of framing theory, by focussing in more detail on the interactions between frames and the importance of interdisciplinary and inter-organisational activity in driving policy change. The theory of epistemic communities, with its focus on small networks of elite technical experts (albeit originally developed from research with scientists) has significant scope to be extended to other transnational groups of non-scientists, as we have shown in our case study on the CDSB, allowing us to examine more precisely *who* is involved in boundary-work. However, theories of epistemic communities and boundary-work both largely ignore financial interests: experts are presumed to have other motives for engaging on an issue and working to bring about change. Given that the potential financial gain to large accountancy firms in setting carbon accounting standards – defining the space they wish to occupy – is considerable, this is an area that calls for greater practical scrutiny and related theory development.

The paper makes a contribution to carbon accounting theory, policy and practice by providing an explanation of how and why there is likely to be controversy in defining and operationalising carbon accounting standards. Carbon accounting encompasses a wide range of activities, each with one or more different professional 'homes' and often overlapping claims to expertise. By clearly defining these distinct frames of carbon accounting and who is involved in them, we hope to have provided a conceptual and practical basis for these different communities to work more closely together. Boundary organisations such as the CDSB can play a vital role in bringing together experts from different communities to facilitative cooperative action, but this first requires a mutual recognition of the basis for, and value of, respective competences. For example, the perspective of a 'physical' carbon accounting expert could potentially highlight and contribute to the development of practical methods for accounting and reporting on an organisation's carbon *stocks* or potential emissions (most standards, including the GHG Protocol and CDSB's Reporting Framework currently only cover carbon *flows* or current emissions). A recent report has highlighted the importance that such information could have for valuations in the oil and gas sector (Leaton, 2011) and similar principles could potentially be applied to companies with substantial holdings of forest, peatlands or, in future, biochar or geologically sequestered carbon dioxide. The perspective of product carbon footprint practitioners could be drawn on to help provide more investor-relevant information on product stewardship and related liabilities. Carbon market practitioners could work collaboratively with accountants to develop guidance on how to value and report on carbon offsets created under different standards with varying degrees of fungibility. Conversely, organisational accountancy practices and skills could be invaluable to 'political' carbon accounting actors currently contemplating new rules for monitoring, reporting and verification of national emissions post-2012 (see discussion in Prag et al., 2011). We are not suggesting that these should all be tasks for the CDSB (which is in fact aware of and considering some of these issues); but rather that any organisation with an interest in progressing carbon accounting may find it useful to consider such perspectives and recognise the contribution that experts from different communities can bring to the debate.

Acknowledgements

The authors would like to thank the CDSB, anonymous reviewers and editors for their comments on the paper, and all interviewees. Dr Lovell expresses gratitude to the Nuffield Foundation – some of the research underpinning this paper is funded by a Nuffield New Career Development Fellowship called 'Fungible Carbon', held jointly with Professor Donald MacKenzie at the University of Edinburgh.

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